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ABSTRACT

Preservice teachers can learn about science teaching through the guidance of a secondary science teacher while taking methods courses at a university or college. This paper describes the preservice and inservice teachers' perceptions of this collaborative experience and the outcomes resulting from the experience. Exploration and study into the nature of this collaborative effort indicate that a sense of a science education community was present. In order to explore this idea and others in terms of a school district and university collaboration, this paper discusses: (1) the collaborative studied; (2) the perceptions of preservice teachers, inservice teachers, and others involved with the collaborative; (3) a comparison of the findings of the study to characteristics of partnerships and education communities that promote effective teacher preparation and professional development; (4) implications for continued improvement and growth; and (5) creating a community of science educators. (Contains 16 references.) (DDR)

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Creating a Community of Science Educators: Perceptions of Preservice Teachers and Inservice Teachers on Their Professional Development Experiences

by
Joan Mackin and David Klindienst

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Changes in programs for teacher preparation have been implied by the national goals established to promote improvement in education. Fenstermacher (1992) indicates that these goals for student learning promote outcomes in teacher preparation that require new investments in teacher learning.

> "... it is more important than ever that teachers have the capacity to appraise their actions, evaluate their work, anticipate and control consequences, incorporate new theory and research into practice, and possess the skills and understanding needed to explain their work to other teachers, and to students and their parents." (Fenstermacher, 1992 p. 182).

According to Darling-Hammond (1994), clinical experiences must enable teachers to learn about students' development and approaches to learning while supporting them with guided instruction and opportunities to reflect on their teaching. Before reform and change can occur in our educational system, change in teacher preparation and professional development should occur as well.

The preparation for secondary science teaching described in this article represents a departure from past practices. Traditionally preservice teachers learned about teaching in methods courses as preparation for their first field experience in student teaching. The change occurred because of need for improvements and a collaborative effort between a university and a school district that allowed preservice teachers to gain experiences working with students in secondary classrooms prior to student teaching. As a result of the collaborative effort, preservice teachers now learn about science teaching with the guidance of a secondary science teacher, while taking methods courses at the university. This article describes the preservice and inservice teachers' perceptions of this collaborative experience and the outcomes resulting from the experience. Although the collaborative was formed to prepare preservice teachers, the perceptions and comments from indicate that the collaborative effort promoted reflection and growth for both preservice and inservice teachers. After further exploration and study into the nature of this collaborative effort, the view that the collaborative promoted preparation of preservice teachers, professional development for inservice teachers, and a sense of a science education community began to become apparent. In order to explore these ideas in terms of the school district and university collaborative, this article will describe:

- The secondary science education collaborative studied
- The perceptions of preservice teachers, inservice teachers and others involved with the collaborative

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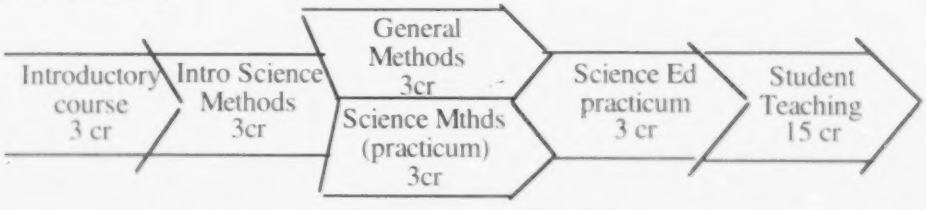
- A comparison of the findings of the study to characteristics of partnerships and education communities that promote effective teacher preparation and professional development
- Implications for continued improvement and growth

Description of the Secondary Science Collaborative

The National Science Education Standards (1996) present a vision for science teachers to be responsible for their own professional development as well as the preparation and professional development of others in the teaching profession. The implications of this vision are that teachers will be active participants in learning about their own teaching and students' learning as well as be facilitators in helping other teachers and preservice teachers achieve their goals of becoming more effective. In addition, teachers are central to the effort but they are not solely responsible for the reform and development (National Research Council, 1996). This implies teachers need to work in collaboration with other educators, university professors, scientists, community members, and teacher educators to develop programs that are supportive of effective teaching and learning.

The description of the collaborative effort and the perceptions of the participants will give insight into how the particular partnership formed has been able to foster the beginnings of a science education community. The extensions of the partnership may have enhanced the sense of community to go beyond the goal for its establishment, to better prepare secondary science teachers and thus improve science learning for their future students.

The preparation of secondary science teachers at the university requires 30 credits in education courses and methodology. The particular part of the preparation described in this article includes a ten week methods course and a practicum for the five weeks of the semester prior to student teaching. Both courses include a field experience component to ease preservice teachers into classroom teaching.


Introductory course 3 cr
Intro Science Methods 3cr
General Methods 3cr
Science Mthds (practicum) 3cr
Science Ed practicum 3 cr
Student Teaching 15 cr

Secondary Science Teacher Preparation

The collaborative effort allows the preservice teachers to actively participate in a practicum experience under the expert supervision and coaching of the secondary science teachers. The goal of this practicum is to provide an opportunity for preservice teachers to learn about the secondary school culture, to gain experience in planning, implementing and reflecting on lessons, and to prepare them for their student teaching experience and their career in science teaching. Some of the

preservice teachers may continue in their student teaching experience in the local school while others have their student teaching experience in other schools located throughout the state.

During the first field experiences for three hours per week, preservice teachers observe teachers and their classes, become familiar with schedules, school practices and school culture, learn about the students they will be teaching as well as the curriculum, and in general refresh their memories about high school and middle school. In some cases, the preservice teachers work with small groups of students in the classes, design activities, become a second pair of hands or eyes during activities, make up questions for quizzes, monitor quizzes and other experiences that allow them to ease into the actual planning and implementing of lessons. The preservice teacher and inservice teacher decide the types of activities that are appropriate during the first practicum experience. The preservice teachers ideas on the field experiences are written in a reflective journal after each classroom visit. The methods class offers opportunity for discussion of school and classroom practices. The field experience allows preservice teachers to observe and become a part of the culture of the secondary school.

Inservice teachers volunteer their time and allow the preservice teachers, university professors and supervisors, to enter their classroom during the experience. The inservice teachers become the coaches and mentors for the preservice teachers while working with the university instructor and supervisor. In most cases, the initial three hour per week practicum allows the preservice teacher time to become familiar with the school and classroom environments. This allows observation of students, teaching strategies and the curriculum for the classes that will be taught during the last five week practicum. During the five week practicum experience, the inservice teachers confer with the preservice teachers in order to assist them in preparation and implementation of lessons. Addressing the needs of the learners, assessing student progress, reviewing curriculum materials, making decisions about teaching strategies, and in general implementing the lesson are discussed. By this time, the preservice teachers are more familiar with the classes they will be teaching, have practiced lessons and have written lesson plans that are reviewed by inservice teachers in the methods classes with their peers.

The supervisor, the inservice teacher and the preservice teacher form a team that utilizes a continuous improvement process which allow all parties to assess and enhance their professional skills. The supervisor gains practice in applying appropriate evaluation and coaching techniques. The inservice teacher is able to reflect on their pedagogical development and employ new strategies which are appropriate to their professional situation. The preservice teacher is involved in shaping a program designed to improve their teaching skills. Each member of the team coaches the other members to help them to reach their goals.

Inservice teachers know the expectations of the program and can work closely and collaboratively with the supervisor. Since this experience occurs each semester, the normal

routines of the students and staff in the schools are not disrupted during the field experience. As the semester progresses, there is an openness due to the efforts of those working together in the program.

The science coordinator and the science education supervisor work together to insure that preservice teachers have certification specific placements and are prepared for their student teaching experience. Through the team effort, these placements may be made during the first week of the semester. This allows the preservice teachers to meet with their collaborating teacher and begin the practicum in the third week of the ten week methods course.

The science coordinator and the supervisor also discuss concerns with teachers and with the preservice teachers. A valuable part of the practicum is learning about the school climate from a teacher's perspective and solving real problems in a real classroom in a real school. The liaison between the school and the university allows discussion of the concerns and learning experiences for all involved. The team effort between the supervisor and the science coordinator is the foundation for the program.

The role of the methods instructor is to integrate the school experience with the theories and learning experiences of the methods course. By observing and discussing the strategies modeled by the inservice teachers, the methods instructor and their peers, the preservice teachers can form foundations for their future classrooms. During the field experience preservice teacher gain more insight into student learning when teachers use various strategies. They can compare their perceptions of the strategy when it was used in the methods class to classroom observations. Ideas that preservice teachers bring to class from the field experience for discussion make the course relevant to their experience. This offers the instructor opportunities to relate them to the readings, research and activities of the methods course.

Understanding is an active process in which the learner is constantly constructing meaning through individual or social processes. Active process implies both active involvement and application of ideas. According to Brooks (1990) during the learning process, the learner is constantly checking and comparing new information against old rules or knowledge, revising old ideas as discrepancies occur, and constructing new understandings or meanings. It would seem logical that ideas that apply to promoting effective learning for students are the bases for teacher preparation and professional development. However, are preservice teachers and inservice teachers comparing and checking new information with their established ideas, seeing different approaches and reflecting on their teaching practices?

Perceptions of Preservice and Inservice Teachers

Parallel surveys were given to the preservice teachers and inservice teachers who participated in the science education collaborative during the time period from the Fall semester of

1995 to the Spring semester of 1997. Surveys were mailed to the students who had graduated, were student teaching, or who were in their first year of teaching. The purpose of having the participants in the collaborative answer the survey questions was to gain an understanding of the effectiveness of the program in meeting the challenges for teacher preparation. However, it became apparent that the presence of a professional development component existed for the inservice teachers as well as the anticipated component for preservice teachers.

Two types of questions were on the survey, those using a Likert scale for responses and those allowing participants to supply their own answers. The first set of questions asked about ratings of the actual characteristics of the program such as preparation of preservice teachers. These questions were answered on a Likert scale of 1 to 4 (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree) with a space for additional comments. The second set of questions addressed the time involved, benefits, and areas that should be changed. These were open ended questions with space to write answers. Samples of these questions appear in the Appendix. Participants were encouraged to give their ideas about areas for improvement and methods to accomplish these improvements as well as the benefits of the program. The averages of the responses for the first set of questions(scale of 1 to 4) are shown in Table 1 in the Appendix.

The vision for change expressed in the *Science Standards* implies collegial relationships and collaboration. O'Loughlin (1988) identified two major recommendations when a collaborative is formed between a university and a school district . First, the collaboration can only be effective when the parties involved perceive a mutual or genuinely equal relationship. Second, all parties involved commit to engaging in dialogue and mutual inquiry(O'Loughlin, 1988). Goodlad(1986) indicates that the essential goal of a collaboration is that it fosters growth in areas of overlapping interest. In view of O'Loughlin's and Goodlad's recommendations, it is important to consider what views and perceptions of the program are held by teachers, preservice teachers, and college instructors on the shared responsibilities and benefits for all concerned. Do the participants in the collaborative perceive a mutual relationship with common goals fostering growth and mutual inquiry?

When comparing O'Loughlin's and Goodlad's criteria for an effective program to the ideas of the participants, the participants did perceive that the program was of mutual benefit. Both groups answered the questions in a very positive manner. The mean of the responses was 3.46 for the inservice teachers and 3.57 for the preservice teachers. Both groups responded in the area that approached strongly agree giving a very positive perception of the characteristics of the experiences and preparation. One area, the integration of the methods course with the field experience, did not rate in this range which indicates a need for improvement The averages of the responses are shown in Table 1 in the Appendix.

The respondents indicated that preservice teachers felt prepared for the program, believed themselves an asset in the classroom, felt evaluations and conferences were helpful, and that the time spent was sufficient. Both groups indicated a very positive perception of the program in the each of the areas addressed by the questions.

A difference of means t test indicated there was no significant difference in the average of the responses to each question by the inservice teachers' and the group of preservice. student and first year teachers. Both the teachers and the preservice teachers group felt that the preservice teacher was an asset in the classroom, time was sufficient, the preservice teachers were adequately prepared and both experienced reflection on their teaching as shown on Table 1 in the Appendix.

Comparison of the findings to the characteristics of partnerships and education communities

Qualitative analysis was completed for the responses to the open-ended questions. These questions dealt with the time spent in collaboration of preservice and inservice teachers, additions to the learning environment by the preservice teacher, suggestions for improvement, and time that should be spent in classroom teaching. Questions were directed to find the most beneficial part of the program and to gain insight into what was perceived to be most beneficial for the inservice teacher and preservice teachers. Samples of the questions are shown in the Appendix. The responses of the open ended questions will be discussed in terms of the following questions about the aspects of the collaborative effort and the practicum experience.

- Did preservice teachers and inservice teachers comparing and checking new information with their established ideas, seeing different approaches and reflecting on their teaching practices?
- Did the participants in the collaborative perceive a mutual relationship with common goals fostering growth and mutual inquiry?
- Did a collaborative effort and sense of community develop so that university professors, high school teachers and preservice teachers work together to share ideas and goals to promote more effective science teaching?

In addition to the answers from the survey, observations noted by the university professors, comments on extensions that occurred, and new programs that were implemented as a result of the collaborative will be included in the data discussed.

According to the *National Science Education Standards* :

> "When teachers have the time and opportunity to describe their own views about learning and teaching and to compare, contrast, and revise their views, they come to understand the nature of exemplary science teaching." (National Research Council, 1996 p. 67)

A part of the experience reported by both preservice teachers and inservice teachers as being beneficial were the conferences on teaching strategies and presentation of the lessons. Both

groups indicated that time spent in conferring before and after lessons were taught was beneficial and caused reflections on their teaching practices.

Preservice teachers developed their own approaches to the implementation of the lesson. In some cases the preservice teacher had the opportunity to observe the lesson being taught prior to the class they would teach. In other cases they taught a class and may have changed the approach in the next class they taught. The idea of comparing views on teaching a lesson was expressed by a teacher in this manner:

> *"Her ideas led to clearer development of the lesson plan than was previously taught. . A reason for me to question my teaching style"*

In this case, the inservice teacher had the opportunity to view another approach that seem to develop the lesson more clearly. The teacher was given a different view of how the lesson could be conducted. Another teacher comments on what was helpful.

> *"The ability to reflect ... opportunity to get fresh ideas and focus on my teaching and watching the pre-student teacher improve lesson plans!"*

Joyce and Showers (1995) proposed when observing someone else teach, the observer is being coached. In this sense the preservice teacher may be coaching the inservice teacher or vice versa. According to studies by Baker and Showers (1984), coached teachers had longer retention of knowledge and skill dealing with strategies in which they were coached. They also increased the appropriateness of new teaching models over time. In the prior response, an inservice teacher gained new insight on teaching from observing the preservice teacher

The preservice teachers viewed the experience as most beneficial because working with the collaborating teacher offered:

> *"Observing alternative techniques and methods of teaching along with helpful hints on logistics in the classroom, gaining practice in lab activities, and working with an excellent teacher"*
> *"The reflections and the immediate feedback"*
> *".... feedback, self-evaluation, and making improvements."*

In these responses, preservice teachers indicate the importance of observation in order to gain knowledge of techniques and strategies that were effective for the inservice teacher. The importance of getting feedback and the ability to reflect is critical. Sparks and Hirsh (1997) indicate that teachers will collaborate with peers and others to make sense of the teaching/learning process in context rather than get "knowledge" from "experts" for constructivist professional development experiences. Teachers said that having the preservice teacher provided:

" Someone to bounce ideas off of. . .", "trying various teaching methods." ", I looked at new ways of presenting the materials"

Preservice teachers noted similar observations when referring to benefits for the inservice teacher.

"A time to see his own class from a different perspective , gain new insights & ideas, and catch up with projects."

Again the observation and coaching became a favorable aspect of the experience.

The perceptions indicate that both teachers and preservice teachers felt that the experience does allow comparison of views. The comments suggest that both preservice and inservice teachers had the opportunity to watch other approaches, discuss, revise, and develop more effective strategies. Time was available and new techniques were observed and applied. This suggests that both preservice and inservice teachers were perceiving the opportunity to improve on their teaching with mutual inquiry and with a mutual goal. Not only was preservice teacher preparation occurring, but professional development for the inservice teacher was also a part of the collaborative effort.

According to Richert (1991), teachers must think about experiences. It is not enough for a teacher just to have experience in order to lead to change in their practices. Richert(1991) continues that teachers rarely have the time to think about what "works", what does not "work", and why. Rosentholtz & Kyle (1984) point out that schools normally are not organized to allow teachers to work or think together which is a criterion for teacher learning. We note however that both the preservice teachers and inservice teachers are creating the opportunities to observe what "works" or doesn't "work", talk about their ideas , and reflect on the experiences. Richert indicates that teacher education at both the preservice and inservice levels must include helping teachers learn about how to learn from their experiences.

Following the same theme, one of the Professional Development Standards include in the *National Science Education Standards* was to "Provide opportunities for teachers to learn and use various tools and techniques for self-reflection and collegial reflection, such as peer coaching, portfolios and journals" (National Research Council, 1996 p.68). As part of the requirements for the methods courses, preservice teachers write weekly journals of their experience and are coached in reflective processes to learn more about their beliefs and to think about their observations and teaching experiences. They receive feedback and comments from supervisor which serves as a continuing dialog throughout the experience. They also revise their professional portfolio which has been with them since the began their study in science education. Although one would expect comments on reflection and changes in practice from the preservice teachers, these comments were also made by the inservice teachers who indicated the benefits of collegial reflection and self - reflection. The comment, *"the ability to reflect"* and *"provided ideas for new lessons "* on teacher

surveys infer that teachers were questioning and thinking of future change. One could presume that by sharing the classroom experiences with the preservice teacher, the inservice teacher learned more about their own practices and beliefs. Just as we develop a different type of knowledge when we teach subject matter to our students, we gain insights and learn about our teaching when we explain and discuss classroom experiences with other teachers or preservice teachers.

Did the participants in the collaborative perceive a mutual relationship with common goals fostering growth and mutual inquiry?

The *National Science Education Standards* include the ideas that learning to teach science should occur "... through interactions with practitioners in places where students are learning science such as classrooms and schools." This idea is a definite theme that was stated by the preservice teachers. In addition both preservice teachers and classroom teachers realized the benefits of having another teacher working with them in the classroom. It gave them freedom to try new techniques since there was additional help for preparation and to answer student questions.

Preservice teachers focused on the benefits of working in the context of actual classrooms, they reported the following:

> *"Lesson planning, implementation, and seeing classroom management instead of reading about it! Exposure to students. Classroom teaching experience." ; "... Planning lessons, teaching"*

Inservice teachers comment on the benefits tor the preservice teacher as opportunities for

> *"Observation, team teaching, individual and small group work, and classroom instruction."*
> *"Having the opportunity to share ideas, I was a person to bounce ideas off. "*

A preservice teacher indicates the benefit of new ideas and changes:

> *"...new ideas from me, a little change in classroom"*

An inservice teacher indicated that the preservice teacher had strength in certain areas

> *"she was an excellent aid in demonstrations, technology, needs etc. "*

A preservice teacher thought that the advantages for the inservice teacher were:

> *"She got to teach me about her strengths.... and extra help on field trips"*

This statement conveys an additional meaning since both participants were able to identify the ideas that were the teacher's strengths. Several teachers and preservice teachers indicated that the extra person in the room was a benefit.

"helped me out often, gave pupils another perspective, provided ideas for new lessons", extra help for students.",
"....another person to answer questions during class activities"
"Extra help for student questions", "An extra pair of hands and eyes".

The teachers and the preservice teachers perceived that the classroom experience was an asset for both. Having the preservice teacher in the classroom was viewed as having someone who was part of a team teaching experience and shared some responsibility for teaching and preparation for teaching. Although the experience may require more time for conferences and coaching, the teachers did see benefits in having additional help and having time for new or different activities. A second more subtle theme can be seen in these comments that the experience was also one that was good for the students. Students were benefiting by receiving more help and changes in instruction as well as the long term effects of their teacher learning more about his or her own teaching and student learning. Sparks and Hirsh (1997) state that the value of professional development should be judged on the on its effect on student learning.

The comments by both inservice teachers and preservice teachers indicate that the preservice teachers added a new face or a new perspective. Both groups seemed comfortable with this idea. Several teachers included the comment that the preservice teacher was an asset in giving new ideas for presenting materials and sharing ideas. Professional development very often introduces new ideas in a two hour session and teachers return to isolation to practice. This experience provided not only new ideas but an opportunity to practice with peer collaboration. From the inservice teachers and the preservice teachers perspective, a very positive idea comes forth since the students now had two teachers and more opportunities for interactions and to become more actively involved in their learning of science.

This statement by a preservice teacher conveys the benefits of the preservice teacher preparation that was experienced:

" I believe that after working with preservice and student teachers from other disciplines and completing my student teaching experience, the Science Education Department truly prepares you better than ...."

Perhaps the statement of a preservice teacher may summarize a goal of the collaborative as better preparation for the preservice teacher. The preservice teacher's thoughts may be projected to the statements of inservice teachers. The opportunity to reflect, see new methods, compare ideas and have time to try new ideas in their classrooms gave them insights for teaching their students more effectively as well. The comments on the new ideas and having additional help in the classroom for students reflect ideas of working together and viewing the experience as having mutual benefit for all concerned including the secondary students. Both groups, inservice teachers

and preservice teachers, indicated that they were learning more about their teaching and in this manner could move toward the common goal of becoming more effective. They were working together toward this common goal with common inquiry. From the statements of the participants, it may be inferred that there was common growth. Sparks and Hirsh (1997) that participants in professional development can learn from diverse means such as study groups, small group problem solving, observations of peers, journal writing, and involvement in improvement processes.

Creating a Community of Science Educators

Goodlad(1990) describes the tensions that could exist in the school and university partnership in the following manner:

> "Higher education has never been disposed to working collaboratively with the lower schools ... University professors [ironically] complain about both the products of the schools coming to their classes and the poor quality of those who taught them. The schools, on the other hand, would have had little reason to celebrate the appearance on their doorsteps of a sometimes-discordant army of crusaders from the universities intent on a pilgrimage" (pp. 102 - 103).

Sergiovanni (1993) suggests that more productive conditions can exist. He describes schools as communities. He indicates that such communities are bonded together by common ideas and goals. The members transform from individuals to members with meaningful relationships who share common sentiments and traditions which are sustained. Can the tension be changed by the collaborative effort and sense of community develop so that university professors, high school teachers and preservice teachers can work together with shared ideas and goals?

The sense of community may be found in the observations that a university professor made when visiting a high school classroom. He indicated that teachers spoke to him in the hall to tell him about the work they were doing in their classes. He was amazed since these teachers were not currently working with the preservice teachers during this semester. The teachers still regarded him as part of the collaborative effort and the community. He also noted the open atmosphere for visitors in the classroom. The university professor was welcome. This is quite unlike the characterization made by Goodlad (1990).

Teachers collaborated with the supervisors and the university professors to give suggestions and discuss improvements and new ideas. Suggestions were made to teach small groups in classroom settings for the introductory methods course offered before the courses described in this article. In this case the teachers were willing to take on new responsibilities and the program was extended. This is not the characterization of crusaders dictating what will happen, but of teachers taking responsibility for finding new and better ways for preservice teachers to learn about teaching.

Joint inservice programs were held at the school and university with teachers. preservice teachers and university instructors indicating their needs and being an integral part of the planning and implementation. The inservice was offered to preservice teachers, student teachers, inservice teachers and graduate students. This type of collaborative effort gives teachers and future teachers efficacy in designing inservice programs that are meaningful to them.

Additional opportunities to extend the sense of community came with joint ventures such as hosting the Junior Science and Humanities Symposium. Preservice teachers were learning about this type of event while acting as presiders. College professors and graduate students from the various departments in the sciences, mathematics, engineering and education were judges of the high school students research projects. They were working together toward the goal of helping high school students learn more about research and conferences to present the research.

High school physics teachers were invited to participate in a Physics Education Seminar offered at the university to share their ideas with professors and graduate students from the Physics Department and the Department of Curriculum and Instruction. There was mutual respect, inquiry and learning during the sessions of the seminar.

Although the extensions outlined are a beginning, it would seem that tensions that may have existed are diminishing and being replaced with joint efforts to understand teaching and learning at both the university and secondary school levels. It would seem that through the joint efforts, the more productive conditions suggested by Sergiovanni (1993) can exist. It would also seem that the members of the collaborative are beginning to develop meaningful relationships and traditions are beginning to develop as well. As the members of the community have more understanding of each other, the tensions described begin to disappear.

Conclusions

The experiences and perceptions related by inservice and preservice teachers imply that the collaborative offers the opportunity for both to learn and become more effective teachers. The collaborative effort allowed preservice teachers and inservice teachers to compare, observe other teaching strategies, see share ideas, and reflect on their teaching practices. The perceptions of both groups indicate that the experiences they shared allowed them to become actively involved in these activities during the practicum experience. Both teachers and preservice teachers reported investigating, reflecting upon, and changing their teaching practices. The comments indicated that the collaboration fostered growth for both the teachers and the inservice teachers. This growth allows teachers to promote more effective student learning.

Learning and improving one's teaching is an active process that require risk taking, trust, and collegial support. These are factors that may be different from the traditional views of presently held in some colleges and schools (National Research Council, 1996). The collaborative

offered the opportunity for preservice and classroom teachers to become actively involved with collegial support. Preservice teachers were practicing their skills in the context of the science classroom. Teachers had the opportunity to share ideas with the preservice teacher and supervisor. They discussed methods of improving the program both in the survey and in meetings after the experience.

According to the *National Science Education Standards*, learning to teach science should be done in context with real students, real classrooms, real student work and real experience with real curriculums in science. Field experience should begin as early as possible in the preservice program and be continuous throughout the program. Integrated knowledge for teaching is developed over time (National Research Council, 1996). The collaborative between the school district allows this to happen in a gradual manner before the preservice teachers leave campus for their student teaching experience in various parts of the state. As the preservice teachers indicated, a benefit was being "*eased into classroom teaching*" It also allows gradual learning and change for classroom teachers.

Hall (1996) states that departmentalized high schools promote isolation, and thus collaborative efforts are more difficult. However, the collaborative described began to meet the special needs of secondary science teachers and preservice teachers as a goal. In this way, the collaborative became focused on science education and promoted a sense of working together toward the goal of promoting more effective science teaching and thus promoting student learning of science concepts. Science teaching has been the target of newspaper headlines for many years. Osguthorpe, Harris, Harris & Black (1995) note that collaboration occurs after people connect with ideas, form relationships based on equity and trust, and develop commitments to share goals. It is true that teachers are isolated in schools but the collaborative offers opportunities to invite others into classrooms and share problems as well as effective teaching strategies. The findings indicated that this is happening and that openness has replaced isolation. Isolation was not found and teachers comment that it was nice to have the instructors and supervisors in their school.

Hall also notes that the collaborative requires more time commitment. However, the survey perceptions also indicated that teachers have time to reflect, extra help in the classrooms and students have more individual attention. Perhaps the time commitment for one part of the community endeavors is offset by the time gained from the assets of the collaborative.

Goodlad (1994) indicates that a powerful symbiosis of school and university might be key to the relationships being productive and healthy. He emphasizes having the parties have cultural differences as an asset. He also states that combined effort and commitment must be shared. The promise of reality of extra rewards to off set the extra time and work spent together with a share mission give a sustained relationship a better chance to exist. Observations in the field suggest that a synergy exists when the university educators and teachers join together in discussions and

meetings. This is evidenced by the new ideas that these meetings produce and have been used in the program. There are bridges to creation of the collaborative. The supervisor and the Science Coordinator have understanding of both cultures. The bridges facilitate teachers, preservice teachers, supervisors and university instructors becoming part of a collaborative group and working toward a common goal. This idea of working together for the benefit of both of symbionts forms the basic idea for the community effort.

Grimmett and Ratzlaff (1986) found that cooperating teachers may not be prepared for the role of student teacher supervisor. During the two year experience, this did not seem to be the case. They worked with the supervisor and the preservice teachers in a collaborative manner. Grimmett and Ratzlaff (1986) noted that cooperating teachers for the methods course and those for the student teaching course have little contact with each other and with the university. In the cases of those preservice teachers who leave the area for their student teaching, this may be true. For those that remain in the area, opportunities for contact between cooperating teachers, the pre-student supervisor, the student teaching supervisor and the university instructors exist. It is not unusual in the collaborative that the preservice supervisor becomes a resource for finding information on a current lesson or working on an activity with student teachers while supervising preservice teachers. Interaction can occur between the student teaching supervisor and the preservice supervisor to gain insights for improving preparation of student teachers as well as identifying those that areas where student teacher preparation is effective. The opportunity for sharing ideas adds to sense of community.

There are some definite areas from improvements and suggestions that were made on the surveys to indicate continuous growth. One is the idea of continuity. As supervisors and instructors who are graduate teaching assistants leave campus, some continuity and retention of successful practices should occur. The is a strong need for a coordinator for both school and university. Schoon and Sandoval (1997) note that science teacher preparation should not consist of a succession of unrelated activities. Preservice teachers indicated the need for more integration of the methods course and the field experience. There is a strong need for theory to be accompanied by strategies and how to implement lessons with in the context of school culture.. Effective teaching is integrating knowledge of subject, pedagogy, curriculum and students to promote student learning. The methods course must include modeling and practice of strategies as well as an emphasis on theory and research.

Teacher might benefit from more opportunities to share professional development activities that address their needs. Continued effort should be made to promote professional development and develop activities as an addition or compliment to their work with preservice teachers.

Although the survey indicated a positive response, the present collaborative between the school district and university is still in its infancy. Just as caring for an infant requires constant

supervision and stability so does the continued success of the collaboration. This survey reflects two years of the program. Additional study is necessary to determine if the participants of the collaborative will have the same perceptions as the community grows and changes.

Review of the data indicated that the tensions that might exist between university professors and secondary school teachers have been eased and that they can work together toward common goals. In the future, the collaborative effort could be extended to the student teaching experience. Instead of having only a small number of the preservice teachers remain in the local area, it may be possible to involve more secondary schools and continue the preparation through the student teaching experience.

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APPENDIX

Table 1

Question Topic	Average Response Inservice Teachers (scale of 4)	Average Response Preservice Teachers (scale of 4)
Preservice teacher preparation in content area	3.35	3.54
Preservice teacher preparation in pedagogy	3.46	3.47
Preservice teacher was an asset in the classroom	3.54	3.71
College supervisor helpful	3.58	3.69
Feedback given was beneficial to the preservice teacher	3.42	3.74
Experience caused reflection on teaching	3.54	3.83
midterm evaluation was beneficial	3.23	3.35
final evaluation was beneficial	3.33	3.30
Time spent working with the preservice teacher was sufficient	3.38	3.65
Preservice teacher had adequate time to observe other teachers	3.73	3.48
Methods experience allowed enough time to observe the classroom environment before teaching	3.50	3.48
Content of the methods course correlates with the field experience		3.04

n= 13 inservice teachers and n= 24 preservice and student teachers

Questions from Inservice Teacher Survey:

TEACHER FEEDBACK ON SCIED 497A PRACTICUM

Using the scale from 1 to 4 below each statement, indicate the degree to which you agree with each statement. Please add comments to explain your choice. 1 = strongly disagree 2 = disagree 3 = agree 4 = strongly agree

1. The preservice teacher was prepared **in content.**
Comments: 1 2 3 4

2. The preservice teacher was prepared **in pedagogy.**
Comments:
1 2 3 4

3. The preservice teacher was an asset in the classroom.
Comments:
1 2 3 4

4. The college supervisor was helpful in the 497A experience.
Comments:
1 2 3 4

5. Feedback I gave was beneficial to the preservice teacher in learning about classroom teaching.
Comments:
1 2 3 4

6. Working with a preservice teacher has caused me to reflect on my own teaching style.
Comments:
1 2 3 4

7. The midterm evaluation conference was beneficial.
Comments:
1 2 3 4

8. The final evaluation conference was beneficial.
Comments:
1 2 3 4

9. The time I spent working with the preservice teacher was sufficient.
Comments:
1 2 3 4

10. The preservice teacher had adequate time to observe other teachers.
Comments
1 2 3 4

11. The Science Education 412 practicum allowed enough observation time for the student to learn about the classroom environment.
Comments:
1 2 3 4

12. How much time did you spend working with/coaching the preservice teacher?
13. What did the preservice teacher add to the learning environment?
14. How much time did you allow the preservice teacher to spend in actual classroom teaching?
15. Should provisions be made which would allow for more classroom instruction by the preservice teacher?
16. What do you feel were the **most beneficial** aspects of the Science Education 497A experience for you?
17. What do you feel were the most beneficial aspects for the preservice teacher?
18. What activities/projects are appropriate for preservice teacher.
19. How often would you like to work with a preservice teacher?
20. What suggestions would you make to improve this experience for future preservice teachers?

One additional question was asked on the Preservice Teacher Survey.

12. The content in the methods class(SCIED 412) correlates with the 497A field experience was adequate.
Comments:
1 2 3 4